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1765

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Ohnuma, et al.
Serial No. : 09/050,182
Filed : March 26, 1998
Title : METHOD OF MANUFACTURING A SEMICONDUCTOR DEVICE

Art Unit : 1765
Examiner : R. Kunemund

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

REPLY TO ACTION OF JULY 14, 2003

The application has not been amended in reply to the current action.

Claims 1-59 and 75-115 are pending, with claims 1, 9, 17, 25, 45, 52, 82, 88, 94 and 100 being independent. Claims 60-74 have been withdrawn from consideration.

Claims 1-59 and 75-115 have been rejected for obviousness-type double-patenting over claims 1-31 of Yamazaki, U.S. Patent No. 5,700,333. Applicant requests reconsideration and withdrawal of this rejection for the reasons discussed below.

Independent claim 1 recites a method of manufacturing a semiconductor device including forming an amorphous semiconductor film over a substrate having an insulating surface and providing the amorphous semiconductor film with an element that promotes crystallization of the amorphous semiconductor film. The amorphous semiconductor film undergoes a first heat treatment to form a crystalline semiconductor film. An impurity element belonging to Group 15 is introduced into a first portion of the crystalline semiconductor film while a second portion of the crystalline semiconductor film is not provided with the impurity element. The first and second portions of the semiconductor film are in contact with the insulating surface over the substrate. The amorphous semiconductor film then undergoes a second heat treatment for gettering so that the element contained in the second portion is moved to a first portion in a direction parallel to the insulating surface.

Applicant requests reconsideration and withdrawal of the rejection of claim 1 and its dependent claims because the claims of Yamazaki fail to describe or suggest (1) that the "first and second portions of the crystalline semiconductor film are in contact with the insulating surface over the substrate," as recited in claim 1, or (2) "performing a second heat treatment for

gettering so that the element contained in the second portion is moved to the first portion in a direction *parallel to the insulating surface*" (emphasis added), as also recited in claim 1.

While the specification of Yamazaki may not be relied upon as the basis for a double patenting rejection, reference to the specification provides useful illustration of the subject matter claimed by Yamazaki. As described in the specification, a first heat treatment is performed to crystallize an amorphous silicon film 203 which has been coated with a nickel acetate solution to accelerate crystallization (col. 6, lines 14-37). Phosphorus is then implanted into the resulting crystalline silicon film 204 to form a layer of high concentration phosphorus as shown by the "Xs" in Fig. 2B of Yamazaki (col. 6, lines 38-46). Fig. 2B of Yamazaki also shows that the implanted layer of high concentration phosphorous, which the Examiner seems to equate to the claimed first portion of the crystalline semiconductor film, is not in contact with the silicon oxide film 202, which the Examiner seems to equate to the claimed insulating surface, and, therefore, is not "in contact with the insulating surface over the substrate" as recited in claim 1.

Yamazaki patent describes conducting a second heat treatment to getter the nickel from the crystalline silicon film 204 to the layer of high concentration phosphorus (col. 6, lines 47-52). As shown in Fig. 2B of Yamazaki, the nickel, which the Examiner seems to equate to the claimed element, moves vertically from the crystalline silicon film 204 to the high concentration phosphorus layer shown by the "X"s. The nickel, therefore, moves *perpendicularly* to the silicon oxide film 202, which the Examiner seems to equate to the insulating layer over the substrate. Accordingly, the nickel does not move "in a direction *parallel to the insulating surface* over the substrate" (emphasis added) as recited in claim 1.

Like the specification, the claims of Yamazaki also fail to describe or suggest having first and second portions of a semiconductor film in contact with an insulating surface over the substrate, or gettering so that an element contained in the second portion is moved to the first portion in a direction parallel to the insulating surface. Instead, using claim 1 of Yamazaki as an example, the claims merely recite that a gettering layer or a gettering region is formed on or within a semiconductor layer, and that the semiconductor layer and the gettering layer or region are heated to getter metal contained in the semiconductor layer. Accordingly, for at least these

reasons, applicant respectfully requests reconsideration and withdrawal of the double-patenting rejection of claim 1 and its dependent claims.

Independent claims 17, 45, 82, 88, 94 and 100 also recite "wherein the first and second portions of the crystalline semiconductor film are in contact with the insulating surface over the substrate" and "performing a second heat treatment for gettering so that the element contained in the second portion is moved to the first portion in a lateral direction/direction parallel to the insulating surface." Accordingly, applicant requests withdrawal of the double patenting rejection of claims 17, 45, 82, 88, 94, and 100, and their dependent claims, for at least the reasons discussed above with reference to claim 1.

Independent claims 9 and 25 similarly recite "wherein the second and third portions of the crystalline semiconductor film are in contact with the insulating surface over the substrate" and "performing a second heat treatment for gettering so that the element contained in the third portion is moved to the second portion in a lateral direction to the insulating surface." Claim 52 recites "performing a second heat treatment for gettering so that the element contained in the second portion is moved to the first portion in a lateral direction to the insulating surface." Accordingly, applicant requests withdrawal of the double patenting rejection of claims 9, 25, and 52, and their dependent claims, for at least the same reasons as those discussed above with reference to claim 1.

Independent claims 1, 9, 82, 88, 94, and 100 also have been rejected along with their dependent claims 2-16, 76, 77, 83-87, 89-93, 95-99, 101-108, and 112-115 as being unpatentable over Yamazaki. Applicant requests withdrawal of the rejection of claims 1, 9, 82, 88, 94, and 100 and their dependent claims for at least the same reasons as those discussed above with reference to claim 1.

Independent claims 17, 25, 45, and 52 have been rejected along with their dependent claims 18-24, 26-44, 46-51, 53-58, 75, 78-81, and 109-111 as being unpatentable over Yamazaki in view of Zhang (U.S. Patent No. 5,569,936). Applicant requests reconsideration and withdrawal of this rejection because, for the reasons discussed above with respect to the double

patenting rejection, Yamazaki does not describe or suggest the subject matter of the independent claims, and because Zhang does not remedy this failure of Yamazaki.

Applicant submits that all claims are in condition for allowance.

Please apply any charges or credits to deposit account 06-1050.

Respectfully submitted,

Date: 10/14/03

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